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(54) **CONTACT TERMINAL**

(75) Inventors: **Rudolf Kraemer**, Lautertal (DE); **Werner Tille**, Stockstadt (DE)

(73) Assignee: **Tyco Electronics AMP GmbH**, Bensheim (DE)

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(51) **Int. Cl.**
H01R 4/40 (2006.01)

(52) **U.S. Cl.** **439/806**; 439/864; 439/815

(58) **Field of Classification Search** 439/806, 439/864, 815
See application file for complete search history.

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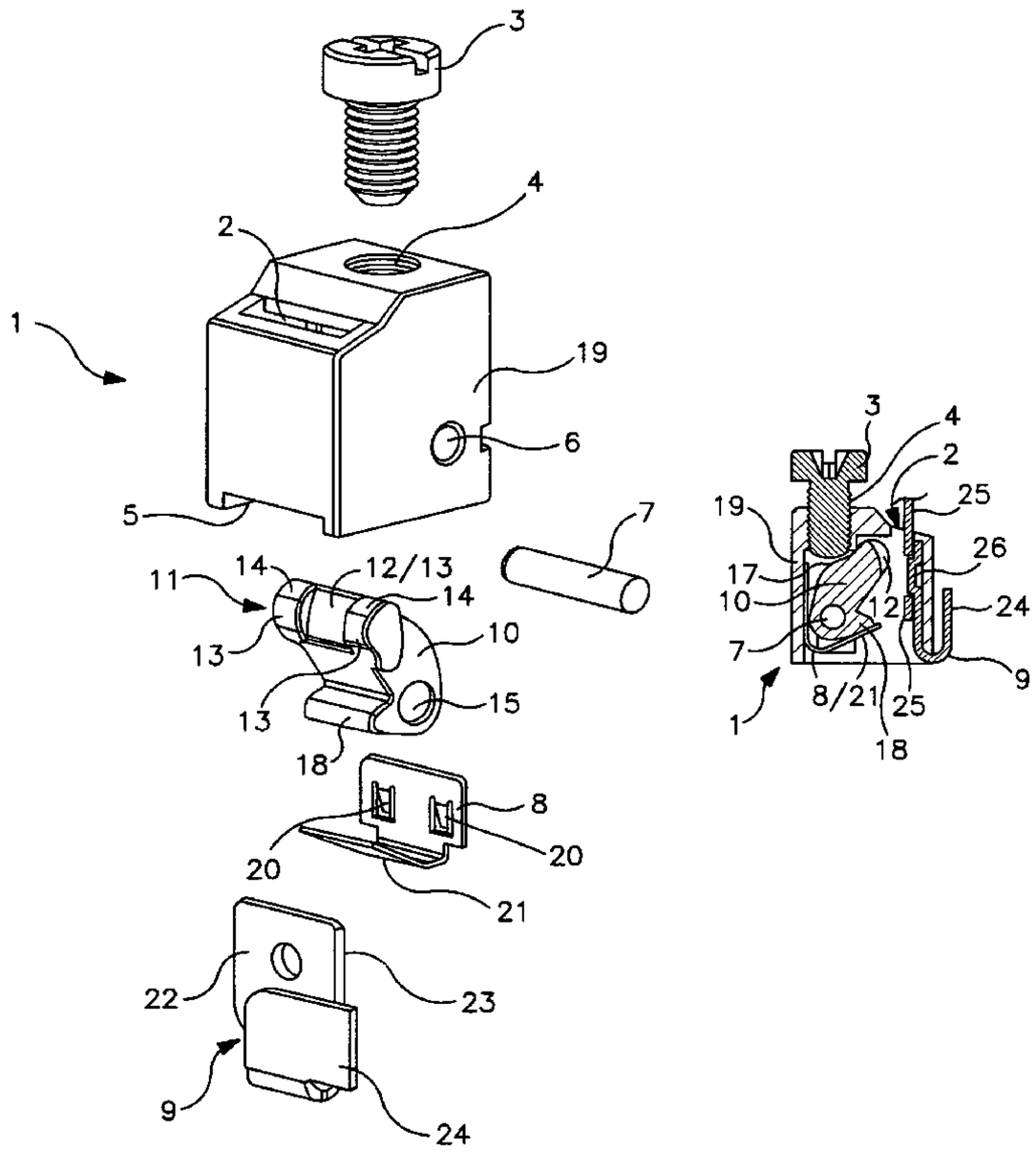
Primary Examiner—Tho D. Ta
(74) *Attorney, Agent, or Firm*—Barley Snyder, LLC

(57) **ABSTRACT**

A contact terminal, by means of which an annular connector or two connectors may be gripped, is described. The contact terminal comprises a housing with a pivotally mounted terminal element which may be biased onto a contact face mounted on the housing at a contact region. A holding element is provided in the contact region, to prevent a connector inserted into the contact terminal from being pulled out in the lateral direction. The terminal element has a terminal face to grip the connector against the contact face.

17 Claims, 3 Drawing Sheets



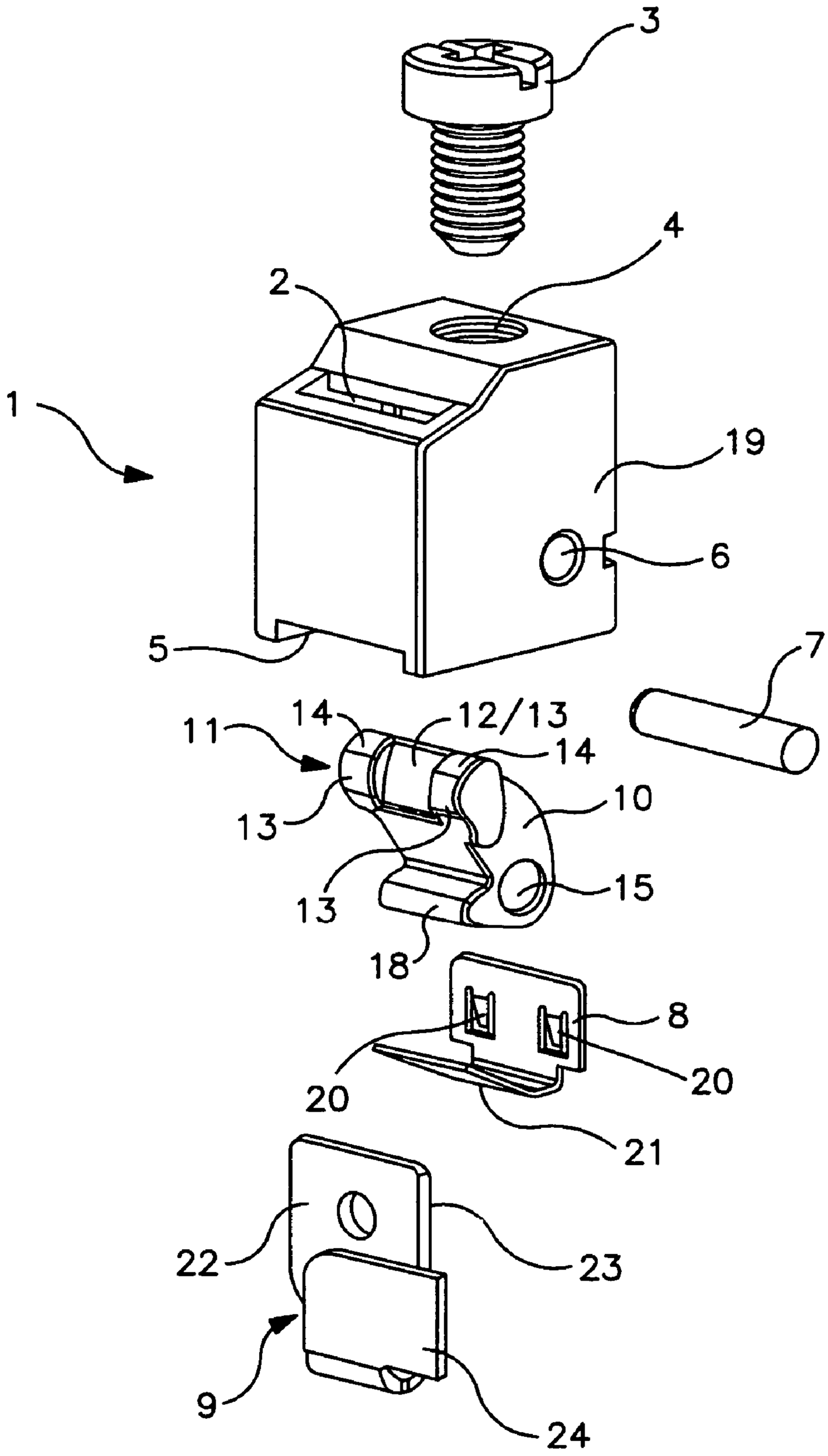


FIG. 1

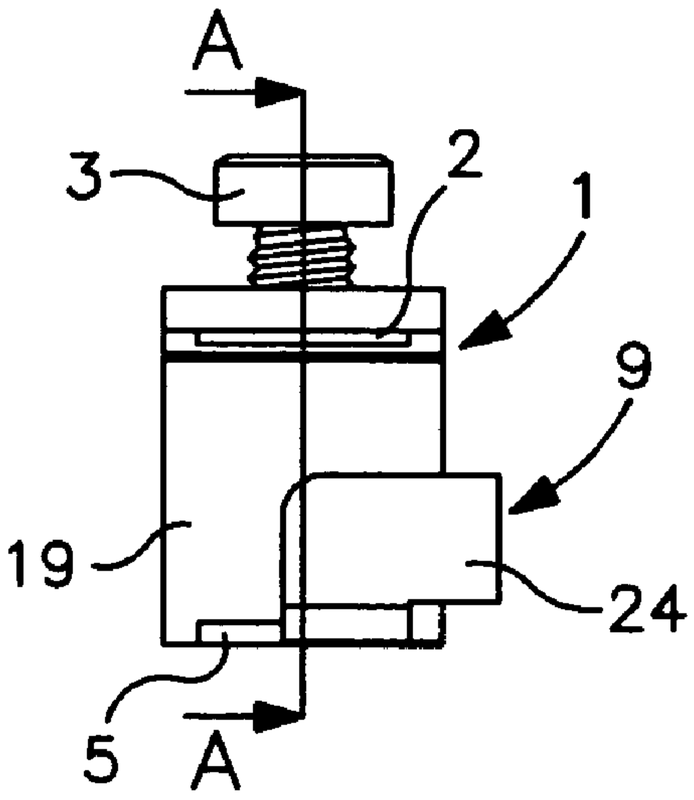


FIG. 2

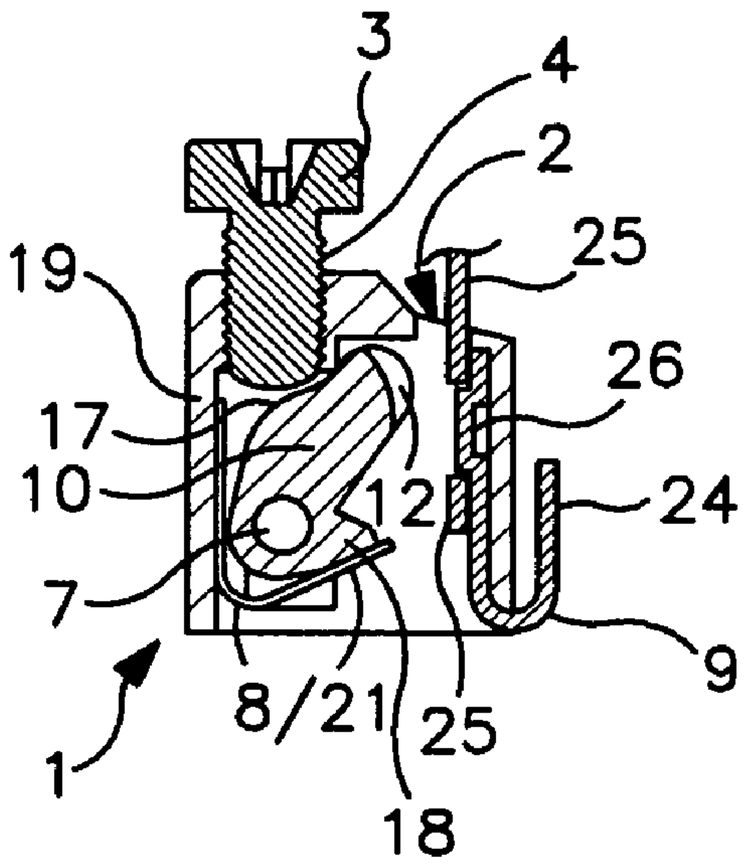


FIG. 3

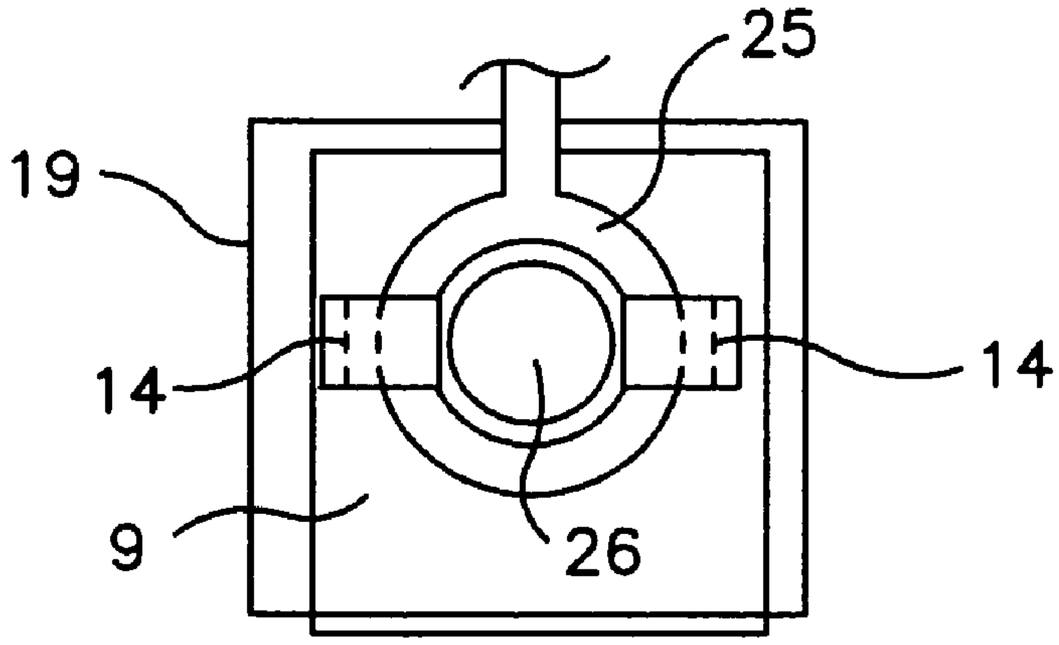


FIG. 4

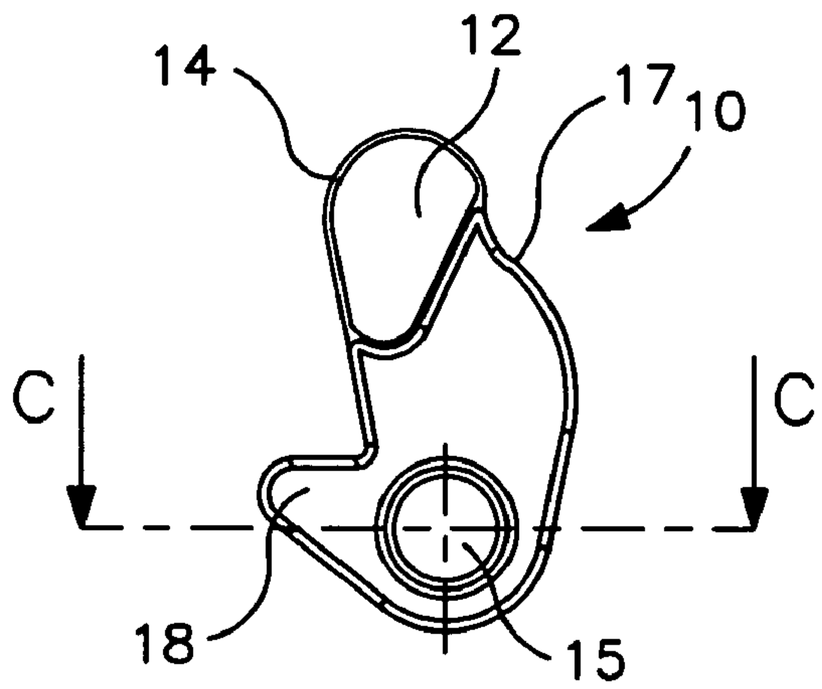


FIG. 5

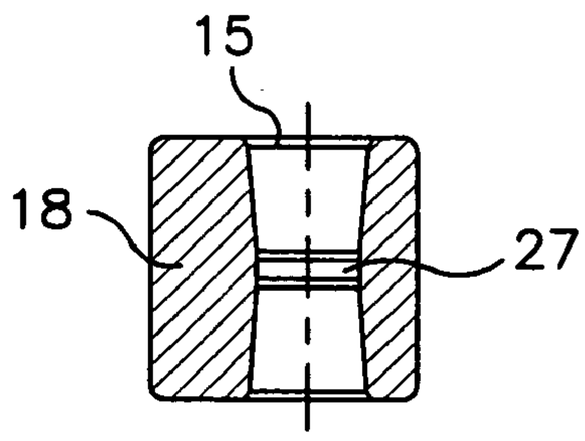


FIG. 6

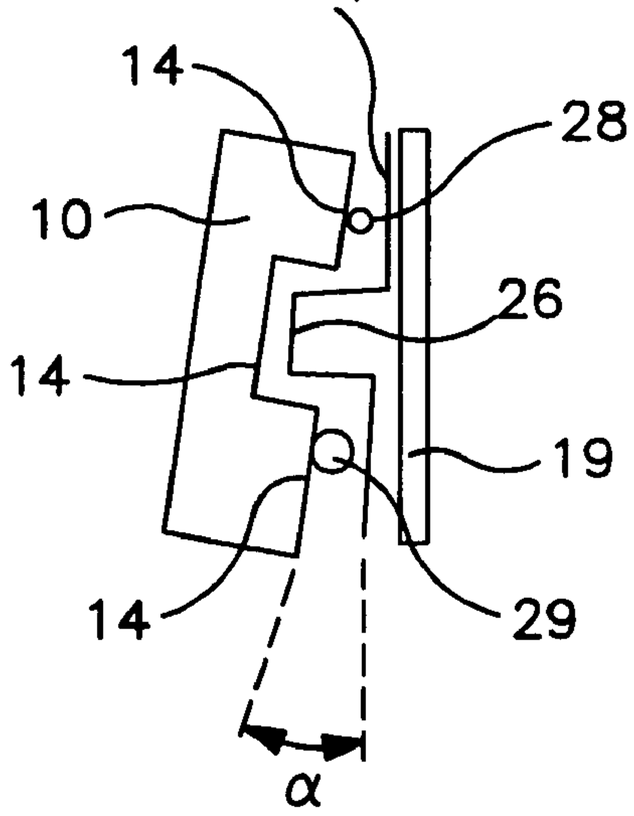


FIG. 7

CONTACT TERMINAL

FIELD OF THE INVENTION

The invention relates to a contact terminal, and more particularly to a screw terminal according to the preamble of claim **1**.

BACKGROUND

Screw terminals are known in which the screw terminal comprises a terminal element by means of which a connector may be gripped against a contact associated with the terminal element. The connector may be biased against the associated contact by means the terminal element, via a screw, for example. The associated contact may, for example, comprise a flat contact plate that has the connector, which may be conducting wire, biased against it by means of the terminal element. It is further known that annular connectors may be screwed to the contact by means of a screw as the terminal element. The screw is screwed through a hole in the annular connector. Different connectors require different terminal elements.

The object of the invention is to provide a contact terminal by means of which an annular connector may be gripped. A further object of the invention is to produce a contact terminal by means of which connectors of different forms may be securely and reliably contacted by an associated contact.

SUMMARY

The object of the invention is achieved by a contact terminal having the characteristics of claim **1**. This contact terminal has the advantage that annular connectors may be contacted securely and reliably. Furthermore, connectors in the form of conductive wires as well as in the form of annular connectors may be contacted securely and reliably. These advantages are achieved by providing a terminal element that may be biased against a contact face of an associated contact. The contact face comprises a holding element that protrudes from the contact face in the direction of the terminal element and secures an annular connector against extraction from the contact terminal. The holding element and the terminal element are preferably configured such that linear connectors, which are arranged to the side of the holding element, may be biased against the contact face by means of the terminal element.

Further advantageous embodiments of the invention are provided in the dependent claims.

In an exemplary embodiment of the contact face, the holding element is configured as part of the contact face and, with respect to the remainder of the contact face, protrudes in the direction toward the terminal element. The holding element preferably has an annular lateral contour by means of which, on the one hand, a large border region for seating of the annular connector is provided and, on the other hand, the adjustment of the annular connector on the contact face is made possible.

In a further embodiment of the contact terminal, the terminal element comprises a terminal region that may be biased in the direction of the contact face. A recess, which is associated with the holding element, is provided on the terminal region of the terminal element. In addition, the terminal region comprises a terminal face which is provided for gripping the connector to it and which is arranged to the side of the holding element. Secure gripping of the connector to the terminal face, independently of the shape of the connector, can thus be achieved, the holding element being associated with the recess and the holding element not resting on the terminal element or only resting with slight pressure when the connector is gripped.

Terminal faces are preferably configured on either side of the recess on the terminal region of the terminal element. Connectors can therefore be gripped at least with two terminal faces. In addition, two connectors can also be gripped simultaneously. The holding element is preferably at least partially circular or annular in shape.

In an exemplary embodiment, the terminal element, which is pivotally mounted on the housing of the contact terminal via an axis of rotation, is configured in the form of a lever arm. The lever arm comprises a seating face that is provided for the seating of a screw. The housing of the contact terminal comprises a screw thread for screwing in the screw, configured on an upper face of the contact terminal. In addition, the terminal element comprises a cam in the region of the axis of rotation, upon which a biasing means acts, which biases the terminal element against the screw.

In a further exemplary embodiment the screw thread is arranged on the same side of the contact terminal as an insertion opening, which is provided for inserting one or more contact elements into the contact terminal.

In a further exemplary embodiment the terminal element is pivotally mounted on an axis of rotation, the mounting being such that the terminal element may be tilted in the plane, which is predetermined by the axis of rotation, in a predetermined angular range. The terminal face of the terminal element can thus be arranged at a predetermined angle to the contact face of the contact. Thus, two connectors of different thickness may be biased against the contact face simultaneously with a terminal element.

In an exemplary embodiment, the tiltable mounting of the terminal element is achieved by the axis of rotation having a constant diameter and the bearing bore of the terminal element having a diameter that increases in size from the center region out toward the two openings of the bearing bore. The axis of rotation itself has a constant diameter in this embodiment. In a similar embodiment, the bearing bore may have a constant diameter and the pin that defines the axis of rotation, from a center region toward the two ends, may respectively have a decreasing diameter.

In an exemplary embodiment, the contact region is part of a contact plate which preferably has a U-shaped configuration. The contact region is arranged inside the housing of the contact terminal and the second arm or connecting region of the contact plate is arranged outside the housing. The second arm has the function of connecting a further contact. The U-shaped configuration of the contact plate is a simple and cost-effective construction of a contact terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described hereinafter in greater detail with reference to figures, in which:

FIG. **1** is an exploded view of a contact terminal according to an exemplary embodiment of the present invention;

FIG. **2** is a first side view of the contact terminal of FIG. **1**;

FIG. **3** is a cross-section of the contact terminal of FIGS. **1** and **2** taken along line A—A in FIG. **2**;

FIG. **4** is a cross-section through a terminal element of the contact terminal of FIGS. **1**–**3** showing a gripped annular connector;

FIG. **5** is a cross-section of the terminal element of the contact terminal of FIGS. **1**–**3**;

FIG. **6** is a cross-section of the bearing bore of the terminal element of FIG. **5**, taken along line C—C in FIG. **5**; and

FIG. **7** is a partial cross-section of a contact terminal, which grips two conducting wires of different thickness according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

FIG. **1** is an exploded view of a contact terminal **1** having a housing **19**, a pin **7**, a screw **3**, a terminal element **10**, a spring plate **8** and a contact plate **9**. The housing **19** comprises a tapped hole **4** on the upper side, into which the screw **3** may be screwed. A slit-shaped contact opening **2** is formed on the same side of the housing **19**. Bearing bores **6** for mounting the pin **7** are provided in opposing side walls of the housing **19**. In addition, the housing **19** comprises an offset **5** on a bottom lateral edge of a front wall, by which the front of the housing **19** is set back. The terminal element **10** is configured substantially in the form of a lever arm, the bottom region thereof is provided with a bearing bore **15**. In the region of the bearing bore **15**, a cam **18** is formed perpendicularly to the bearing bore **15** on the terminal element **10**. In the upper end region the terminal element **10** comprises a terminal region **11**, which has a recess **12**. Two terminal faces **14** are arranged to the side of the recess **12**, wherein the terminal faces **14** display rounded faces that are provided with fluting **13** and are preferably arranged at the same level on an axis parallel to the bearing bore **15**. The terminal region **11** also comprises fluting **13** in the region of the recess **12**.

The spring plate **8** comprises a holding region, in which two holding tabs **20** are formed. The holding region is connected to a contact region **21**, wherein the holding region and the contact region **21** are arranged at an angle of <90° to each other.

The contact plate **9** has a substantially U-shaped configuration, wherein a first arm of the U-shape exhibits a contact region **22** having a contact face **23** and the second arm of the U-shape exhibits a connecting region **24**.

FIG. **2** shows the contact terminal **1** in the assembled state in a first side view onto the contact opening **2** and the connecting region **24** of the contact plate **9**, which is arranged outside of the housing **19**. The contact plate **9** is guided into the inside of the housing **19** via the offset **5**. The screw **3** is screwed into the tapped hole **4** (shown in FIG. **1**).

FIG. **3** is a cross-section of the contact terminal **1**. The terminal element **10** is pivotally mounted via the pin **7**, which is mounted in bearing bores **6** (shown in FIG. **1**), provided in opposing side walls of the housing **19**. The terminal element **10** comprises a seating face **17** that is associated with the screw **3**. The seating face **17** is configured in the upper region of the terminal element **10** opposing the terminal faces **14** on a back of the terminal element.

The spring plate **8** is attached to an interior back wall of the housing **19** by means of the holding tabs **20** (shown in FIG. **1**), wherein the seating region **21** rests on the cam **18** of the terminal element **10** and the terminal element **10** is biased against the screw **3** at the seating face **17**. Opposite the terminal element **10**, the contact region **22** of the contact plate **9** is arranged on an interior front wall of the housing **19**. The contact region **22** is configured substantially as a flat plate, wherein a holding element **26** protrudes in the direction of the terminal element **10** and has at least an essentially circular shaped element **26**. An annular connector **25** is mounted on the holding element **26**. An open annular shape or a partially annular shape may also be used for the connector instead of the closed annular shape. The annular connector **25** exhibits a hole, with which the holding element **26** engages. The screw **3** is screwed deeper into the housing **19** in order to pivot the contact element **10** to grip the annular connector **25** on the contact plate **9**. The screw **3** presses onto the seating face **17** of the contact element **10** and pivots the contact element **10** comprising the terminal faces **14** and the recess **12** in the direction of the annular connector **25** and the holding element **26** against the resilience of the spring plate **8**. The terminal element **10** and the holding element **26** are arranged such that the holding element **26** is associated with the recess and, when the annular connector **25** is gripped on the contact plate **9**, the terminal faces **14** are arranged to the side of the holding element **26** and rest on the annular connector **25**. The holding element engages with the recess **12**. In the gripped position, the annular connector **25** is prevented from becoming detached from the contact terminal **1** by the holding element **26**.

If the annular connector **25** is to be released from the contact terminal **1** again, the screw **3** is at least partially withdrawn from the housing **19**. The terminal element **10** is consequently pivoted from the gripping position back into an open position by the spring plate **8**. The annular connector **25** is released and may be lifted from the holding element **26** and pulled upward out of the contact opening **2**.

FIG. **4** is a cross-section of the contact terminal **1**, the annular connector **25** being biased against the contact face **23** by the two terminal faces **14** of the terminal element **10**. In the illustrated cross-section, the terminal element **10** is cut in a plane parallel to the contact plate **9** in the region of the recess **12**, such that only the two terminal faces **14** of the contact element **10** are shown. The annular connector **25** basically consists of a conductive ring. The annular connector **25** is placed on the holding element **26** and may be biased against the contact plate **9** by means of the two terminal faces **14** arranged on the side of the holding element **26**.

Depending on the chosen embodiment, the holding element **26** may have arbitrary shapes that prevent lateral removal of the connector. As illustrated in FIG. **4**, the holding element **26** according to one exemplary embodiment has a circular configuration, in order to perform an adjustment function for the annular connector **25** in addition to the holding function. As a result of the circular lateral contour of the holding element **26** and the circular contour of the hole of the annular connector **25**, an adjustment of the annular connector **25** to the position of the holding element **26** is achieved. The diameters of the holding element **26** and the hole of the annular connector **25** may be matched to one another for that purpose. Depending on the chosen embodiment, the holding element **26** may also be configured as a part of the housing **19** which protrudes through a corresponding opening in the contact plate **9**. In addition, the holding element **26** may also be configured on the terminal region **11** of the terminal element **10** instead of the recess **12** and protrude beyond the terminal faces **14** toward the contact face **23**.

In a simple embodiment the terminal element **10** only comprises one terminal face **14**, which is arranged to the side of the holding element **26**. Depending on the chosen embodiment the recess **12** may be omitted. This is particularly the case when the height of the holding element **26**, by which the holding element **26** protrudes beyond the contact

face **23** or the terminal faces **14**, is less than the thickness of the connector that is to be gripped, in particular the annular connector **25**.

In addition, the recess **12** may be omitted if the terminal face **14** of the terminal element **10** is arranged adjacent to the holding element **26**. However, the terminal element **10** preferably comprises a plurality of terminal faces **14** that are arranged in various regions to the side of the holding element **26**. It is advantageous in this embodiment if the terminal faces **14** protrude beyond the terminal region **11** of the terminal element **10**. Instead of the illustrated embodiment, three or four terminal faces **14** may also be provided, which are arranged in a wide variety of arrangements to the side of the holding element **26**. The preferred arrangement is illustrated in FIG. **4**, in which the terminal face **14** is arranged at the same level and parallel to the axis of rotation of the terminal element **10**, which is determined by the pin **7**.

FIG. **5** is a cross-section of the terminal element **10** in the region of the recess **12**.

FIG. **6** is a cross-section C—C of FIG. **5**, which extends through a center line of the bearing bore **15** and shows an exemplary embodiment of the bearing bore **15**. The bearing bore **15** has a diameter, which increases in size from a center region **27** outward toward the openings of the bearing bore **15** on both sides. The bearing bore **15** thus consists of two bore portions that preferably taper toward the center region **27**. Tilting of the terminal element **10** relative to the axis of rotation is made possible by the cooperation with the pin **7**, which has a substantially cylindrical shape with a constant diameter. As the bearing bore **15** has a constant diameter in a predetermined portion in the center region **27**, parallel mounting of the terminal element **10** in the axis of rotation is also made possible, if the terminal element **10** rests uniformly, for example on the annular connector **25**, by means of the terminal faces **14**, on both sides of the center region **27**, as illustrated in FIG. **4**. However, the double-sided conical bearing bore **15** of FIG. **6** affords the additional advantage that the terminal element **10** is tiltably mounted on both sides perpendicularly to the longitudinal axis of the terminal element **10**. In a simple embodiment, the bearing bore **15** is configured in the form of a single continuously conical bore.

FIG. **7** is a cross-section of a tiltably mounted terminal element at the level of the terminal faces **14**. The cross-section is arranged parallel to the axis of rotation and perpendicular to the contact face **23**. As a result of the tiltable mounting of the terminal element **10**, the terminal element **10** may bias a first and a second connector **28**, **29** against the contact face **23** of the contact plate **9**. The two connectors **28**, **29** are inserted into the contact opening **2** on opposing sides of the holding element **26** and are biased against the contact face **23** of the contact plate **9** by means of the two terminal faces **14** of the terminal element **10**. The first connector **28** has a smaller thickness or diameter than the second connector **29**. In this arrangement the tiltable mounting is effected in the plane of the axis of rotation of the terminal element **10**, since the two terminal faces **14** may thus adopt a predetermined maximum angle α to the contact face **23** of the contact plate **9**, as illustrated in FIG. **7**.

What is claimed is:

1. A contact terminal comprising:

a housing with a pivotally mounted terminal element which may be biased onto a contact face mounted on the housing at a contact region; and

a holding element provided in the contact region, to prevent a connector inserted into the contact terminal from being pulled out in the lateral direction;

the terminal element having two terminal faces arranged in a terminal region to grip the connector against the contact face wherein each terminal face projects toward the contact face, is arranged adjacent to the holding element on one axis being oriented parallel to an axis of rotation of the terminal element and biases the connector against the contact face.

2. The contact terminal according to claim **1**, wherein the holding element is integral with the contact face.

3. The contact terminal according to claim **1**, wherein the holding element comprises at least one partially annular side face to hold an annular connector.

4. The contact terminal according to claim **1**, wherein the terminal element is mounted pivotally about the axis of rotation by bearing members.

5. A contact terminal comprising:

a housing with a pivotally mounted terminal element which may be biased onto a contact face mounted on the housing at a contact region; and

a holding element provided in the contact region, to prevent a connector inserted into the contact terminal from being pulled out in the lateral direction;

the terminal element having a terminal face to grip the connector against the contact face;

wherein the terminal element is configured in the form of a lever arm which is arranged on an axis of rotation in a first end region, a seating face is provided in the opposing second end region of the terminal element, the housing comprises a tapped hole by means of which a screw that is provided for resting on the seating face may be screwed in to bias the terminal element against the contact face.

6. The contact terminal according to claim **5**, wherein the holding element is integral with the contact face.

7. The contact terminal according to claim **5**, wherein the holding element comprises at least one partially annular side face to hold an annular connector.

8. The contact terminal according to claim **5**, wherein the terminal element, in a terminal region, comprises at least one terminal face, which projects toward the contact face, the terminal face being arranged adjacent to the holding element and biasing the connector against the contact face.

9. The contact terminal according to claim **5**, wherein the terminal element is mounted pivotally about the axis of rotation by bearing members.

10. A contact terminal comprising:

a housing with a pivotally mounted terminal element which may be biased onto a contact face mounted on the housing at a contact region; and

a holding element provided in the contact region, to prevent a connector inserted into the contact terminal from being pulled out in the lateral direction;

the terminal element having a terminal face to grip the connector against the contact face;

wherein a screw may be screwed into a tapped hole in the housing for adjusting the position of the terminal element, and a contact opening for the insertion of the connector is provided on the same side of the housing on which the tapped hole is arranged.

11. The contact terminal according to claim **10**, wherein the holding element is integral with the contact face.

12. The contact terminal according to claim **10**, wherein the holding element comprises at least one partially annular side face to hold an annular connector.

13. The contact terminal according to claim 10, wherein the terminal element, in a terminal region, comprises at least one terminal face, which projects toward the contact face, the terminal face being arranged adjacent to the holding element and biasing the connector against the contact face.

14. A contact terminal comprising:

a housing with a pivotally mounted terminal element which may be biased onto a contact face mounted on the housing at a contact region; and

a holding element provided in the contact region to prevent a connector inserted into the contact terminal from being pulled out in the lateral direction;

the terminal element having a terminal face to grip the connector against the contact face

wherein the terminal element is mounted pivotally about an axis of rotation by bearing members configured to allow the terminal element to tilt in the plane of the axis of rotation;

wherein the terminal element comprises a bearing bore through which a pin is guided to define an axis of rotation, the bearing bore comprising a center region having a first diameter, and two cone shaped bearing bore portions, tapering from the center region toward the openings of the bearing bore, wherein the diameters thereof increase toward the ends of the bearing bore.

15. The contact terminal according to claim 14, wherein the holding element is integral with the contact face.

16. The contact terminal according to claim 14, wherein the holding element comprises at least one partially annular side face to hold an annular connector.

17. The contact terminal according to claim 14, wherein the terminal element, in a terminal region, comprises at least one terminal face, which projects toward the contact face, the terminal face being arranged adjacent to the holding element and biasing the connector against the contact face.

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